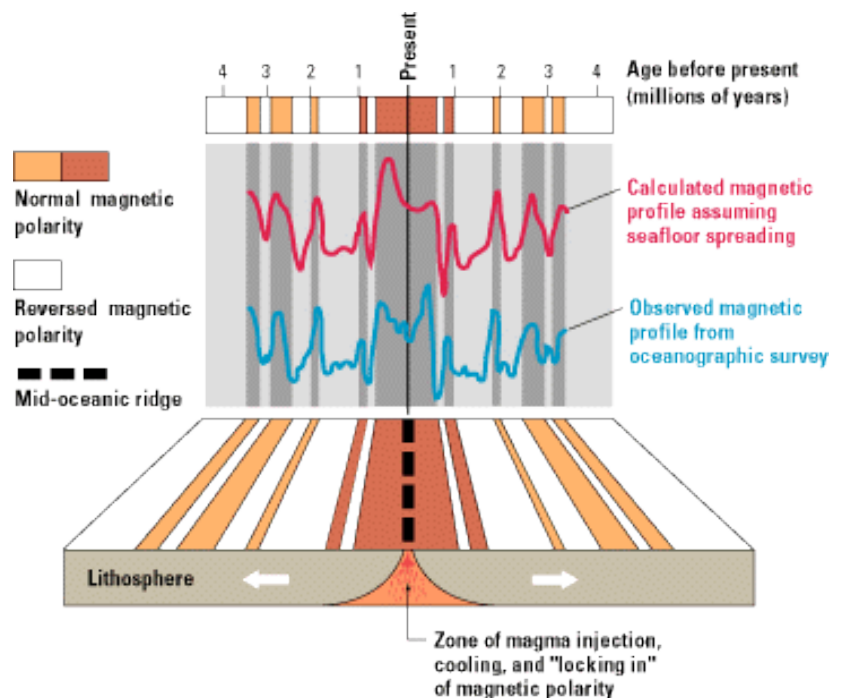


Sea-Floor Spreading Lab

INTRODUCTION

In the late 1950s, considerable research was conducted to find a means of detecting large steel objects beneath the ocean surface (submarines). As a result, sensitive equipment was constructed that could detect very small changes in the earth's magnetic field – and could be carried in aircraft and used to survey large areas from the air. Surveys of the oceans, and in particular, areas on either side of the mid-ocean ridges, showed patterns of magnetic anomalies that were repeated (mirrored) on either side of the spreading ridge. The patterns were carefully plotted, mapped and analyzed. Scientists suggested that the earth's magnetic field periodically reversed direction (North became south, south became north) over many thousands of years. When the reversal occurred, it did so rapidly. As magma erupted along the divergent plate boundary, magnetic minerals within the cooling lava became aligned with the earth's magnetic field at the time of cooling. When the lava solidified, the pattern of magnetic alignment was locked into the rock. When the magnetic field changed direction again, the rock alignment remained as a record of the earth's magnetism at the time of cooling. Careful measurements showed that the patterns of North and South alignment matched exactly on either side of the spreading ridge as seen on the right. Additionally, it was noted that the ages of the rocks increased as distance from the ridge increased. New crust is being created along the divergent plate boundaries and forcing the older crust towards the coastlines. The observation of the oldest crust being far from the boundary and the newest crust being right along it supports the idea that the plates are diverging. These two pieces of evidence support the theory of sea-floor spreading.



PROCEDURE

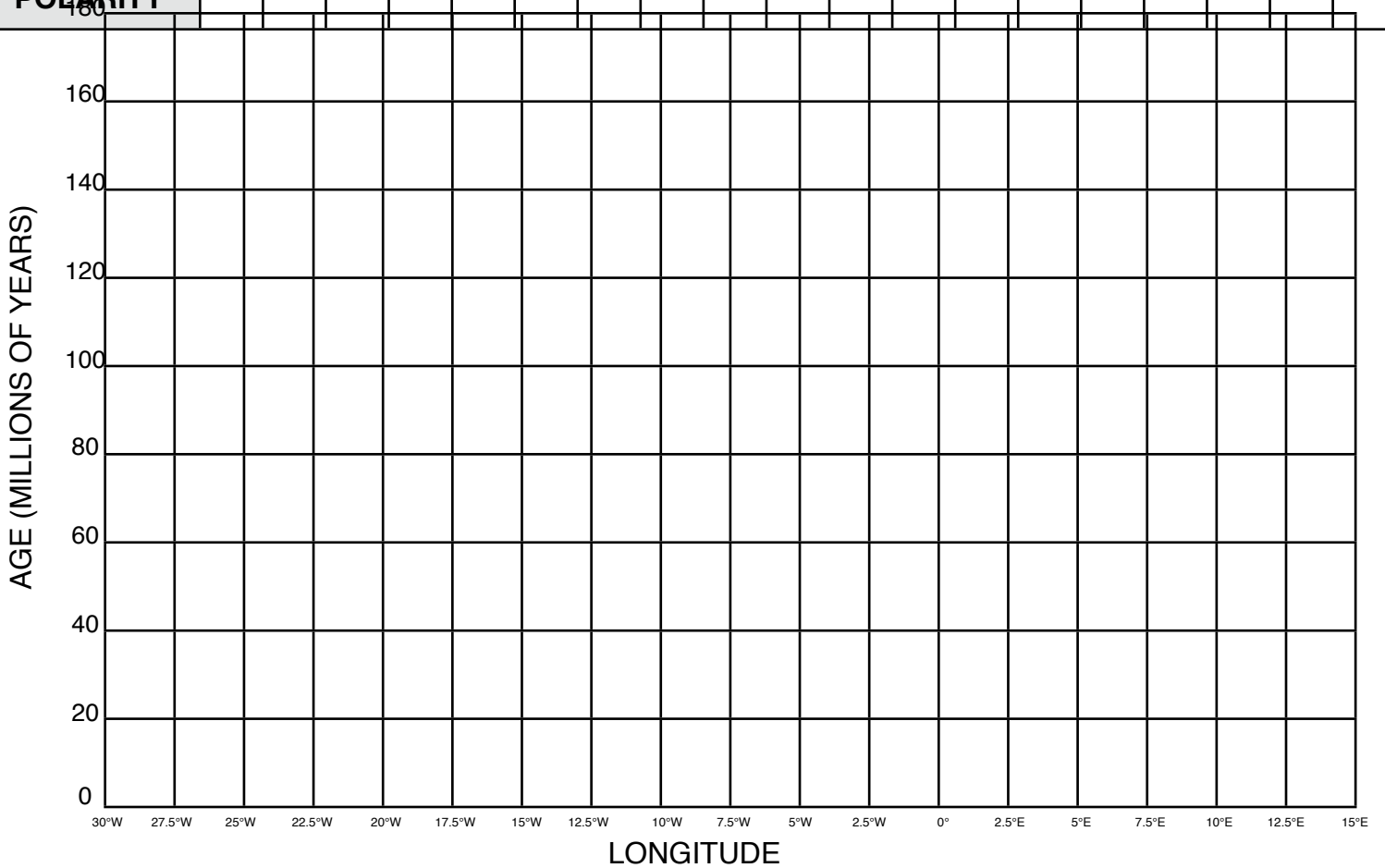
As a class, we will create a model of the Mid-Atlantic Ridge. This model will demonstrate the motion of the plates at a divergent plate boundary as well as how the age of the sea-floor increases as you approach the coastlines. You will also observe the mirror image of magnetic polarity recorded in the rocks on either side of the ridge. Please refer to this demonstration and

your understanding of Earth Science to complete the questions and problems on the following pages.

INSTRUCTIONS: Please plot the data below on the graph. Place dots in the appropriate places using the **AGE** and **LONGITUDE** data. Do not connect the dots. Instead, note where the polarity was N and where it was S. Circle dots representing areas with N polarity using one color and areas with S polarity using a different color. Be sure and make a key below showing which color represents which polarity. Then mark where the plate boundary is located.

DATA TABLE

AGE (millions of years)	180	160	140	120	100	80	60	40	20	0	20	40	60	80	100	120	140	160	180
LONGITUDE	30°W	27.5°W	25°W	22.5°W	20°W	17.5°W	15°W	12.5°W	10°W	7.5°W	5°W	2.5°W	0°	2.5°E	5°E	7.5°E	10°E	12.5°E	15°E
MAGNETIC POLARITY	N	N	S	N	S	S	N	S	N	N	N	S	N	S	S	N	S	N	N



ANALYSIS AND CONCLUSION

1. Describe what happened as you moved the compass over the “sea-floor” from South America to the ridge and then to Africa:

2. State the relationship between age of oceanic crust and distance from divergent plate boundary:

3. What is magnetic polarity? How does the oceanic crust record the polarity?

4. What type of rock is oceanic crust generally made of? _____

5. What type of rock is continental crust generally made of? _____

6. Which type of crust is thicker?

7. Which type of crust is more dense? _____

8. As you travel from a spreading center towards a coastline, what happens to the thickness of sediment on the sea-floor? Explain why.

9. How does the observed change in sea-floor age support the theory of sea-floor spreading?

10. How does the observed pattern of magnetic reversals support the theory of sea-floor spreading?

11. If there is constantly new sea-floor being created along mid-ocean ridges, how come the planet is not increasing in size?
